

Detection of Toxic Cyanobacteria Using the PDS[®] Biosensor

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Introduction

Cyanobacteria can produce molecules hazardous to human health (i.e. hepatotoxins and neurotoxins). The ubiquity of cyanobacteria in terrestrial, as well as freshwater and marine environments, suggest a potential for widespread human exposure. We have developed a Pathogen Detection System (PDS[®]) biosensor to monitor the presence of toxic cyanobacteria in freshwater. This biosensor allows the detection of live bacteria in water and biological fluids, as well as, the detection of cytotoxic compounds on mammalian cells.

Hypotheses

Biophage Pharma Inc., in collaboration with the NRC/BRI, has developed a patented PDS[®] biosensor based on impedance (for more details visit www.biophagepharma.com). The PDS[®] biosensor allows the detection and quantification of living pathogens in water and biological fluids. It can also assess cytotoxicity on mammalian cells (normal and cancer cells). As toxic cyanobacteria emerge as potentially hazardous microorganisms for human, animal and marine health, the PDS biosensor can be used to monitor the presence of cyanobacterial cells in drinking waters. In addition, cyanobacterial toxins should be monitored in cyanobacteria-positive samples as well as in invertebrates, fish or grazing animals used for human consumption.

Methods

Samples are mixed directly with broth media, added in the PDS[®] wells and then monitored for up to 24 hrs.

Results

The PDS[®] biosensor can detect and quantify with great precision a small number of bacteria (about 5 bacteria/ml) without any pre-amplification step. With the addition of a small pre-amplification step, this limit could be lowered without modifying the total time from sample collection to detection. At very low concentrations, the total time for detection varies between 2 h for fast growing bacteria, to 24 h in very slow growing bacteria, which is at least two times faster than conventional culture techniques. In addition, detection is monitored in real time on a computer screen allowing for immediate action as soon as detection occurs.

Conclusions

The PDS[®] biosensor allows the detection of a large number of organisms two times faster than conventional culture techniques. The samples do not require preprocessing and can detect very low number of bacterial cells (5 cells/ml). In addition, detection can be monitored in real time on a computer screen allowing for immediate action as soon as detection occurs. The PDS[®] biosensor can also detect cytotoxicity on mammalian cells